UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/749,405	12/28/2000	Stephan J. Jourdan	2207/7085	5261

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EXAMINER
LI, AIMEE J

ART UNIT	PAPER NUMBER
2183	

DATE MAILED: 11/19/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

	Application No.	Applicant(s)
Office Action Summary	09/749,405	JOURDAN ET AL.
	Examiner	Art Unit	
	Aimee J Li	2183	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *19 August 2004*.

2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
    closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *1-27* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *1-8,10-15 and 17-27* is/are rejected.

7) ☒ Claim(s) *9 and 16* is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All   b) ☐ Some * c) ☐ None of:

    1. ☐ Certified copies of the priority documents have been received.

    2. ☐ Certified copies of the priority documents have been received in Application No. _____.

    3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage
        application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

1.   Claims 1-27 have been considered. Claims 1, 6, and 25 have been amended as per

Applicant's request.

Claim Objections

2.   Claims 9 and 16 are objected to as being dependent upon a rejected base claim, but would

be allowable if rewritten in independent form including all of the limitations of the base claim

and any intervening claims.

Claim Rejections - 35 USC § 102

3.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4.   Claims 24-26 are rejected under 35 U.S.C. 102(b) as being taught by Tran, U.S. Patent

Number 5,822,575 (herein referred to as Tran).

5.   Referring to claim 24, Tran has taught a method for restoring a branch prediction

apparatus following a branch misprediction of a branch instruction, comprising:

        a.   Restoring a base misprediction history register (Tran column 14, line 14 to

                column 15, line 7; column 18, lines 44-62; column 19, lines 31-49; Figure 3; and

                Figure 4); and

        b.   Restoring a branch predictor history register (Tran column 14, line 14 to column

                15, line 7; column 18, lines 44-62column 19, lines 31-49; Figure 3; and Figure 4).

6.   Referring to claim 25, Tran has taught updating a branch predictor (Tran column 14, line

14 to column 15, line 7; column 18, lines 44-62column 19, lines 31-49; Figure 3; and Figure 4).

7.   Referring to claim 26, Tran has taught updating a meta predictor (Tran column 14, line

14 to column 15, line 7; column 18, lines 44-62column 19, lines 31-49; Figure 3; and Figure 4).

Claim Rejections - 35 USC § 103

8.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

9.   Claims 1-8, 10-15, and 17-23 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Chang, Hao, and Patt's "Alternative Implementations of Hybrid Branch Predictors" (herein

referred to as Patt) in view of McFarling's "WRL Technical Note TN-36: Combining Branch

Predictors" (herein referred to as McFarling).

10.   Referring to claim 1, Patt has taught a branch prediction apparatus, comprising:

    a.   A meta predictor to receive as inputs_an index value and a branch prediction to

       . generate a misprediction value in accordance with said inputs (Patt page 252,

       column 2, paragraph 4; page 255, column 1, paragraph 2 to column 2, paragraph

       3; and Figure 2); and

    b.   A logic gate to receive said branch prediction and said misprediction value to

       generate a final prediction (Patt page 252, column 2, paragraph 4; page 255,

       column 1, paragraph 2 to column 2, paragraph 3; and Figure 2).

11.   Patt has not taught a base misprediction history register providing an output. McFarling

has taught a base misprediction history register providing an output (McFarling page 12,

paragraph 2). In regards to McFarling, the counter is similar to the misprediction history

register, since it contains data related to past mispredictions. A person of ordinary skill in the art

at the time the invention was made would have recognized that the counter tracks which

predictor is more accurate, thereby ensuring the combined branch predictor picks the best

predictor to use and reducing mispredictions which cost time. Therefore, it would have been

obvious to a person of ordinary skill in the art at the time the invention was made to incorporate

the misprediction history register of McFarling in the device of Patt.

12.   Referring to claim 2, Patt has not taught wherein said base misprediction history register

includes misprediction history data. McFarling has taught wherein said base misprediction

history register includes misprediction history data (McFarling page 12, paragraph 2). In regards

to McFarling, the counter is similar to the misprediction history register, since it contains data

related to past mispredictions. A person of ordinary skill in the art at the time the invention was

made would have recognized that the counter tracks which predictor is more accurate, thereby

ensuring the combined branch predictor picks the best predictor to use and reducing

mispredictions which cost time. Therefore, it would have been obvious to a person of ordinary

skill in the art at the time the invention was made to incorporate the misprediction history

register of McFarling in the device of Patt.

13.   Referring to claim 3, Patt has taught an instruction that provides said index value (Patt

page 252, column 2, paragraph 4; page 255, column 1, paragraph 2 to column 2, paragraph 3;

and Figure 2).

14.   Referring to claim 4, Patt has taught wherein said instruction is a branch instruction (Patt

page 252, column 2, paragraph 4; page 255, column 1, paragraph 2 to column 2, paragraph 3;

and Figure 2)

15.   Referring to claim 5, Patt has taught wherein said final prediction determines a branch for

said branch instruction (Patt page 252, column 2, paragraph 4; page 255, column 1, paragraph 2

to column 2, paragraph 3; and Figure 2).

16.   Referring to claim 6, Patt has taught a branch predictor that receives said index value and

generates said branch prediction (Patt page 252, column 2, paragraph 4; page 255, column 1,

paragraph 2 to column 2, paragraph 3; and Figure 2).

17.   Referring to claim 7, Patt has taught wherein said branch predictor utilizes a prediction

scheme to generate said branch prediction (Patt page 252, column 2, paragraph 4; page 255,

column 1, paragraph 2 to column 2, paragraph 3; and Figure 2).

18.   Referring to claim 8, Patt has taught wherein said branch predictor includes a target

address field and a prediction table (Patt page 252, column 2, paragraph 4; page 255, column 1,

paragraph 2 to column 2, paragraph 3; and Figure 2).

19.   Referring to claim 10, Patt has taught a method for predicting branches, comprising:

        a.   Receiving an index value and a branch prediction value correlating to said index

               value at a meta predictor (Patt page 252, column 2, paragraph 4; page 255,

               column 1, paragraph 2 to column 2, paragraph 3; and Figure 2); and

        b.   Generating a misprediction value at said meta predictor (Patt page 252, column

               2, paragraph 4; page 255, column 1, paragraph 2 to column 2, paragraph 3; and

               Figure 2).

20.   Patt has not taught a misprediction history value. McFarling has taught a misprediction

history value (McFarling page 12, paragraph 2). In regards to McFarling, the counter is similar

to the misprediction history register, since it contains data related to past mispredictions. A

person of ordinary skill in the art at the time the invention was made would have recognized that

the counter tracks which predictor is more accurate, thereby ensuring the combined branch

predictor picks the best predictor to use and reducing mispredictions which cost time. Therefore,

it would have been obvious to a person of ordinary skill in the art at the time the invention was

made to incorporate the misprediction history register of McFarling in the device of Patt.

21.   Referring to claim 11, Patt has taught generating said branch prediction value at a branch

predictor (Patt page 252, column 2, paragraph 4; page 255, column 1, paragraph 2 to column 2,

paragraph 3; and Figure 2).

22.   Referring to claim 12, Patt has taught receiving an index value at said branch predictor

(Patt page 252, column 2, paragraph 4; page 255, column 1, paragraph 2 to column 2, paragraph

3; and Figure 2).

23.   Referring to claim 13, Patt has taught generating a final prediction according to said

branch prediction and said misprediction value (Patt page 252, column 2, paragraph 4; page 255,

column 1, paragraph 2 to column 2, paragraph 3; and Figure 2).

24.   Referring to claim 14, Patt has taught determining a final value, and updating said meta

predictor and said base misprediction history register according to said final value (Patt page

252, column 2, paragraph 4; page 255, column 1, paragraph 2 to column 2, paragraph 3; and

Figure 2).

25.   Referring to claim 15, Patt has taught wherein said updating includes comparing said

final value to said branch prediction (Patt page 252, column 2, paragraph 4; page 255, column 1,

paragraph 2 to column 2, paragraph 3; and Figure 2).

26.   Referring to claim 17, Patt has taught a processor, comprising:

   a.   A branch predictor to generate a branch prediction (Patt page 252, column 2,

         paragraph 4; page 255, column 1, paragraph 2 to column 2, paragraph 3; and

         Figure 2);

   b.   A meta predictor that receives an index value, said branch prediction data to

         generate a misprediction value (Patt page 252, column 2, paragraph 4; page 255,

         column 1, paragraph 2 to column 2, paragraph 3; and Figure 2).

27.   Patt has not taught a base misprediction history register. McFarling has taught a base

misprediction history register (McFarling page 12, paragraph 2). In regards to McFarling, the

counter is similar to the misprediction history register, since it contains data related to past

mispredictions. A person of ordinary skill in the art at the time the invention was made would

have recognized that the counter tracks which predictor is more accurate, thereby ensuring the

combined branch predictor picks the best predictor to use and reducing mispredictions which

cost time. Therefore, it would have been obvious to a person of ordinary skill in the art at the

time the invention was made to incorporate the misprediction history register of McFarling in the

device of Patt.

28.   Referring to claim 18, Patt has taught a final prediction to correlate to said misprediction

value and said branch prediction value (Patt page 252, column 2, paragraph 4; page 255, column

1, paragraph 2 to column 2, paragraph 3; and Figure 2).

29.   Referring to claim 19, Patt has taught a logic gate to generate said final prediction (Patt

page 252, column 2, paragraph 4; page 255, column 1, paragraph 2 to column 2, paragraph 3;

and Figure 2).

30.   Referring to claim 20, Patt has taught a computer readable medium having stored a

plurality of executable instructions, the plurality of instructions comprising instructions to:

     a.   Receiving an index value and a branch prediction value correlating to said index

        value at a meta predictor (Patt page 252, column 2, paragraph 4; page 255,

        column 1, paragraph 2 to column 2, paragraph 3; and Figure 2); and

     b.   Generating a misprediction value at said meta predictor (Patt page 252, column

        2, paragraph 4; page 255, column 1, paragraph 2 to column 2, paragraph 3; and

        Figure 2).

31.   Patt has not taught a misprediction history value. McFarling has taught a misprediction

history value (McFarling page 12, paragraph 2). In regards to McFarling, the counter is similar

to the misprediction history register, since it contains data related to past mispredictions. A

person of ordinary skill in the art at the time the invention was made would have recognized that

the counter tracks which predictor is more accurate, thereby ensuring the combined branch

predictor picks the best predictor to use and reducing mispredictions which cost time. Therefore,

it would have been obvious to a person of ordinary skill in the art at the time the invention was

made to incorporate the misprediction history register of McFarling in the device of Patt.

32.   Referring to claim 21, Patt has taught an instruction to generate said branch prediction

value at a branch predictor (Patt page 252, column 2, paragraph 4; page 255, column 1,

paragraph 2 to column 2, paragraph 3; and Figure 2).

33.   Referring to claim 22, Patt has taught an instruction to receive an index value at said branch predictor (Patt page 252, column 2, paragraph 4; page 255, column 1, paragraph 2 to column 2, paragraph 3; and Figure 2).

34.   Referring to claim 23, Patt has taught an instruction to generate a final prediction according to said branch prediction and said misprediction value (Patt page 252, column 2, paragraph 4; page 255, column 1, paragraph 2 to column 2, paragraph 3; and Figure 2).

Response to Arguments

35.   Examiner withdraws the objection to the drawings in favor of the amended drawings.

36.   Examiner withdraws the objection to the specification in favor of the arguments presented in regards to the drawings.

37.   Applicant's arguments filed 19 August 2004, with respect to the rejection(s)of claim(s) 1-22 under 102(b) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of the above rejection.

38.   Applicant's arguments filed 19 August 2004 in regards to claims 24-27 have been fully considered but they are not persuasive. Applicant's argue in essence on page 7 "Applicants cannot find a misprediction register in the reference and thus submit that this step cannot be performed by the reference." This has not been found persuasive. Tran has a misprediction tag and branch tag shift that operate similarly to the misprediction register, since there is a signal as to whether the branch has been mispredicted or not and the branch shift register is updated accordingly so that it contains data about whether past branches were mispredicted or not.

Conclusion

39.   The prior art made of record and not relied upon is considered pertinent to applicant's

disclosure as follows. Applicant is reminded that in amending in response to a rejection of

claims, the patentable novelty must be clearly shown in view of the state of the art disclosed by

the references cited and the objections made. Applicant must also show how the amendments

avoid such references and objections. See 37 CFR § 1.111(c).

      a.   Yeh and Patt's "Alternative Implementations of Two-Level Adaptive Branch

           Prediction" has taught branch prediction with misprediction tracking.

      b.   Jacobsen, Rotenberg, and Smith's "Assigning Confidence to Conditional Branch

           Predictions" has taught branch prediction with misprediction tracking.

40.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Aimee J Li whose telephone number is (571) 272-4169. The

examiner can normally be reached on M-T 7:30am-5:00pm.

41.   If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Eddie Chan can be reached on (571) 272-4162. The fax phone number for the

organization where this application or proceeding is assigned is 703-872-9306.
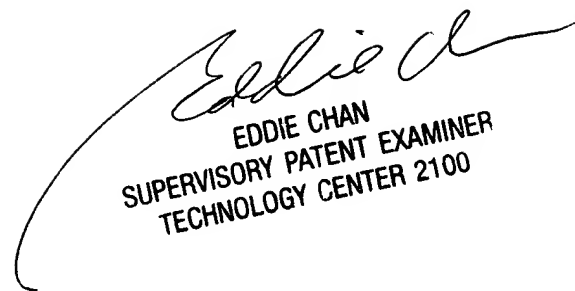
42.   Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AJL
Aimee J. Li
15 November 2004

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